OFFICIAL TEST REPORT

RF

CLASS II PERMISSIVE CHANGE

Report No. ER/2015/40052

Standards : FCC Part 15.247, Cat: DSS

Canada RSS-210: issue 8, Annex 8

Test Result :	**PASS**

In the configuration tested, the EUT complied with the standards specified above.

Applicant :	**Sony Computer Entertainment Inc.** **1-7-1 Konan, Minato-ku, Tokyo 108-0075 Japan**
Product Name:	**PlayStation(R) Vita, PlayStation(R) Vita Testing Kit**
Brand Name:	**SONY**
Model No.:	**PCH-2001. PTEL-2004**
Model Difference:	**Please refer to page 5 for more detail**
Date of test:	**Apr. 13, 2015 ~ Apr. 22, 2015**
Date of EUT Received:	**Apr. 13, 2015**

Test By:	Marcus Tseng ***Marcus Tseng/ Engineer***	***Date:***	Apr. 27, 2015
Prepared By:	Tiffany Kao ***Tiffany Kao / Clerk***	***Date:***	Apr. 27, 2015
Approved By:	Jim Chang ***Jim Chang / Asst. Manager***	***Date:***	Apr. 27, 2015

Testing Laboratory 0513

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Revision History

Report Number	Revision	Description	Issue Date
ER/2015/40052	Rev.00	Initial creation of document	Apr. 27, 2015

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1. GENERAL INFORMATION

1.1. Testing Laboratory

Identification of the Responsible Test Laboratory

Test Lab	**SGS Taiwan Ltd. Mobile Communication Laboratory**
Address	No.134, Wu Kung Road, Wuku Industrial Zone, Wuku District, New Taipei City, Taiwan 24803
Tel	+886-(0)2-22993279
Fax	+886-(0)2-22980488
Website	http://www.tw.sgs.com

Details of Applicant

Applicant's Name	**Sony Computer Entertainment Inc.**
Applicant's Address	1-7-1 Konan, Minato-ku, Tokyo 108-0075 Japan
Contact Person	Kiyoto Sasaki
Tel	+81-3-6748-6333
Fax	+81-3-6748-6383
E-mail	Kiyoto_Sasaki@hq.scei.sony.co.jp

Details of Manufacturer

Manufacturer's Name	**Sony Computer Entertainment Inc.**
Manufacturer's Address	1-7-1 Konan, Minato-ku, Tokyo 108-0075 Japan
Contact Person	Kiyoto Sasaki
Tel	+81-3-6748-6333
Fax	+81-3-6748-6383
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1.2. Product Description

General:

Product Name:	PlayStation(R) Vita, PlayStation(R) Vita Testing Kit	
Brand Name:	SONY	
Model No.:	PCH-2001, PTEL-2004	
Earphone:	Model No.: PCH-ZHS1G, Supplier: Goertek	
USB Cable:	Model No.: N/A, Supplier: LUXSHARE	
Hardware Version:	2.2	
Software Version:	3.50	
Serial No.:	6000109 6000027	
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.	
Class II Permissive change:	Antenna and non-transmitter circuit changed from the original device.	
Power Supply:	3.7Vdc from battery or 5Vdc by AC/DC power adapter.	
	Battery:	Model No.: SP86R, Supplier: SONY
	Adapter :	1. Model No.: ADP-8AR A, Supplier: Delta 2. Model No.: ADP-708SR, Supplier: MITSUMI
	LAN Adaptor:	Model No.: PTEL-UE100, Supplier: Foxconn
Power Cord:	1. Model No.: N/A, Supplier: I-Sheng 2. Model No.: N/A, Supplier: Hirakawa-Hewtech	

Model Difference:

Product Name	Model No.	Accessory
PlayStation(R) Vita	PCH-2001	1. USB Cable 2. Power Cord 3. AC Adapter
PlayStation(R) Vita Testing Kit	PTEL-2004	1. USB Cable 2. Power Cord 3. AC Adapter 4. LAN Adaptor

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Bluetooth:

Bluetooth Version:	☐ V1.1 (GFSK) ☐ V1.2 (GFSK) ☐ V2.0 (GFSK) ☐ V2.0 + EDR (GFSK + π/4DQPSK + 8DPSK) ☒ V2.1 + EDR (GFSK + π/4DQPSK + 8DPSK)
Frequency Range:	2402 – 2480MHz
Channel number:	79 channels max.
Rated Power:	4.16 dBm (Peak)
Modulation type:	Frequency Hopping Spread Spectrum
Antenna Designation:	Mono-pole Antenna, 0.73dBi

This test report applies for Bluetooth and complies with FCC rule part 15C.

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1.3. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: AK8PCH2001** filing to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. And **IC: 409B-PCH2001** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. The composite system (digital device) is in compliance with FCC part 15, and Subpart B is authorized under the DoC procedure.

1.4. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10:2013 and RSS-Gen: issue 4 2014. Radiated testing was performed at an antenna to EUT distance 3 meters. Tested in accordance with FCC Public Notice DA 00-705 – Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

1.5. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.10: 2013. FCC Registration Number are: 990257, Canada Registration Number: 4620A-5.

1.6. Special Accessories

There is no special accessory used while test was conducted.

1.7. Equipment Modifications

There was no modification incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.10:2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI 63.10:2013 & 6.2.2, is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13 and of ANSI C63.10:2013, & Section 6.3, 6.4, 6.5,.and DA 00-705.

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2.4. Configuration of Tested System

Fig. 2-1 Conducted (Antenna Port) and Radiated Emission Configuration

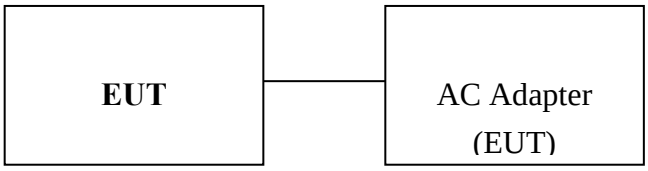

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.
1.	BT Software	N/A	N/A	N/A

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3. SUMMARY OF TEST RESULTS

FCC / IC Rules	Description Of Test	Result
§15.247(b)(1)/ RSS-210 issue 8,§A8.4(2)	Peak Output Power	Compliant
§15.247(d) §15.209(a) (f) RSS-Gen §8.9 RSS-210 issue 8,§A8.5	Band Edges Measurement	Compliant
$15.247(d) §15.209(a) (f) RSS-Gen §8.9 RSS-210 issue 8,§A8.5	TX Spurious Emission	Compliant
§15.203, RSS- Gen §6.7	Antenna Requirement	Compliant

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4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel Low, Mid and High with highest rated data rate were chosen as worst case for full testing. The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth Transmitter for channel Low, Mid and High the worst case E1 position was reported.

Channel Low: channel 1 at 2402MHz
Channel Mid: channel 39 at 2441MHz
Channel High: channel 78 at 2480MHz

In comparison with BR and EDR mode, emission carried out by EDR is chosen as the most representative measurement to perform measurement of radiated spurious emission pursuant to Part 15C.Modulation, EDR, is selected to be performed for 100 kHz Bandwidth Band Edge, Conducted Spurious Emission, Frequency Separation, Number of hopping frequency due to its characteristics of wider bandwidth.

Data type being used to conduct the measurement:
DH1/DH3/DH5 (GFSK) with 1Mbps
2DH1/2DH3/2DH5 (Π/4 DQPSK) with 2Mbps
3DH1/3DH3/3DH5 (8DPSK) with 3Mbps

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
20dB/ 99% Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Frequency Separation	+/- 51.33 Hz
Number of hopping frequency	+/- 51.33 Hz
Time of Occupancy	+/- 51.33 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : **Vertical**)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : **Horizontal**)	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6. PEAK OUTPUT POWER MEASUREMENT

6.1. Standard Applicable:

According to §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The limit: 0.125 Watts.

According to RSS-210 issue 8,§A8.4(2), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, the maximum conducted output power shall not exceed 1 W. For all other frequency hopping systems, the maximum peak conducted output power shall not exceed 0.125 W.

6.2. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/20/2014	12/19/2015
Power Sensor	Anritsu	MA2411B	917032	12/20/2014	12/19/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/02/2015	01/01/2016
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/12/2015	03/11/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	002	01/02/2015	01/01/2016
Splitter	Agilent	11636B	N/A	01/02/2015	01/01/2016

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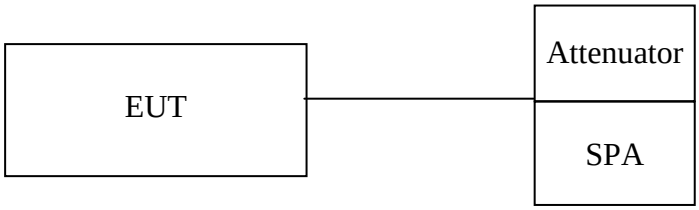
6.3. .Test Set-up:



6.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the
4. power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
5. Record the max. reading.
6. Repeat above procedures until all default test channel is completed.

NOTE: cable loss as 0.5dB that offsets in the spectrum

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6.5. Measurement Result:

BR mode (GFSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	0.55	0.55	0.00114	1
2441.00	0.75	0.75	0.00119	1
2480.00	0.62	0.62	0.00115	1

EDR mode (π/4DQPSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	3.53	3.53	0.00226	0.125
2441.00	3.69	3.69	0.00234	0.125
2480.00	3.48	3.48	0.00223	0.125

EDR mode (8DPSK):

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	4.01	4.01	0.00252	0.125
2441.00	4.16	4.16	0.00261	0.125
2480.00	4.00	4.00	0.00251	0.125

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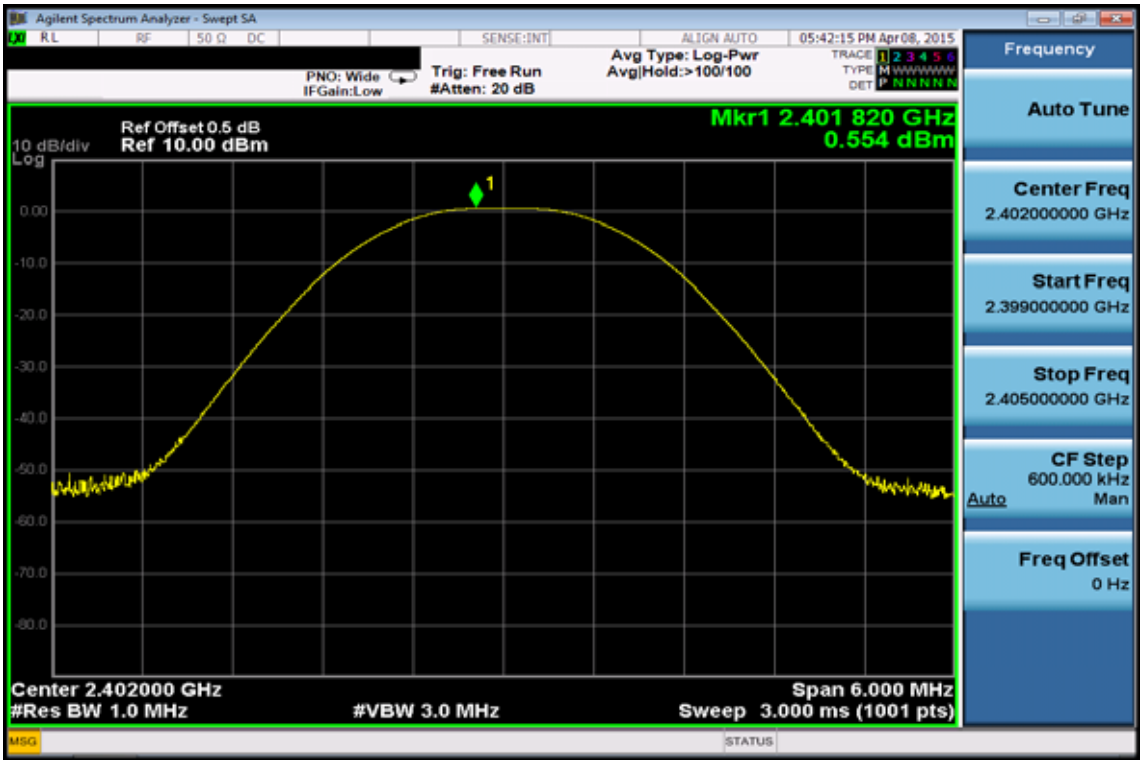
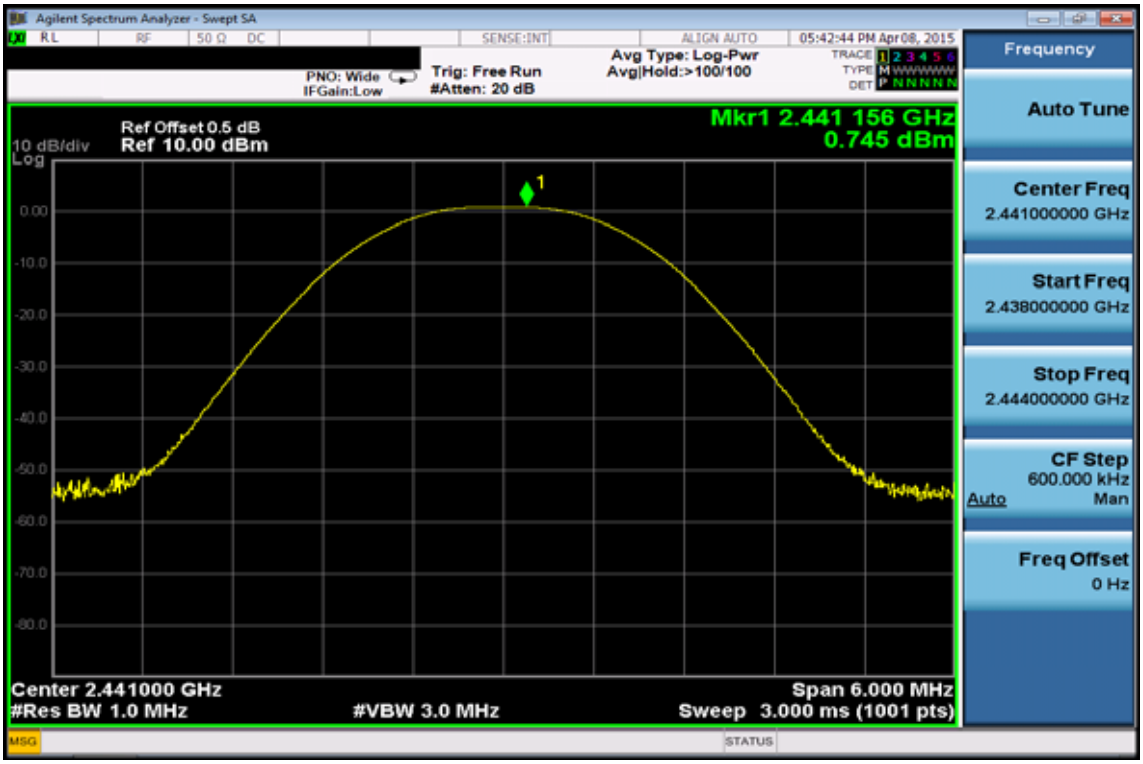
Peak Power Output Data Plot (CH Low) (BR mode)



Peak Power Output Data Plot (CH Mid) (BR mode)



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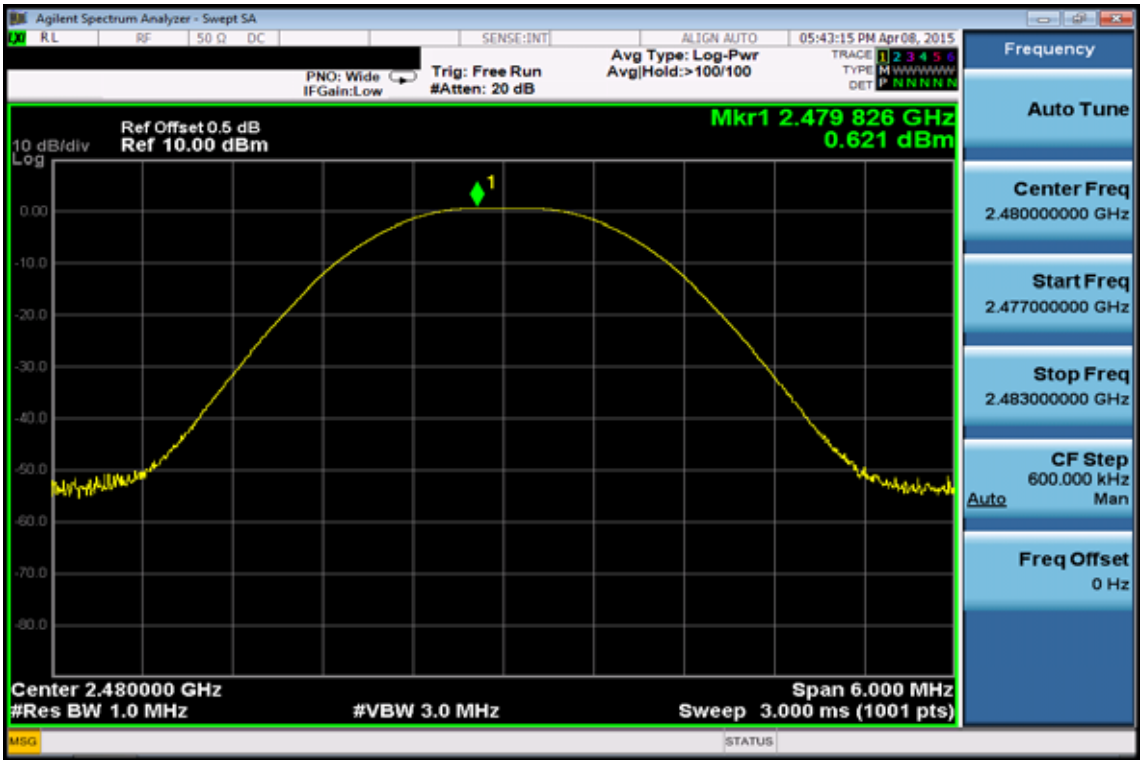
Peak Power Output Data Plot (CH High) (BR mode)



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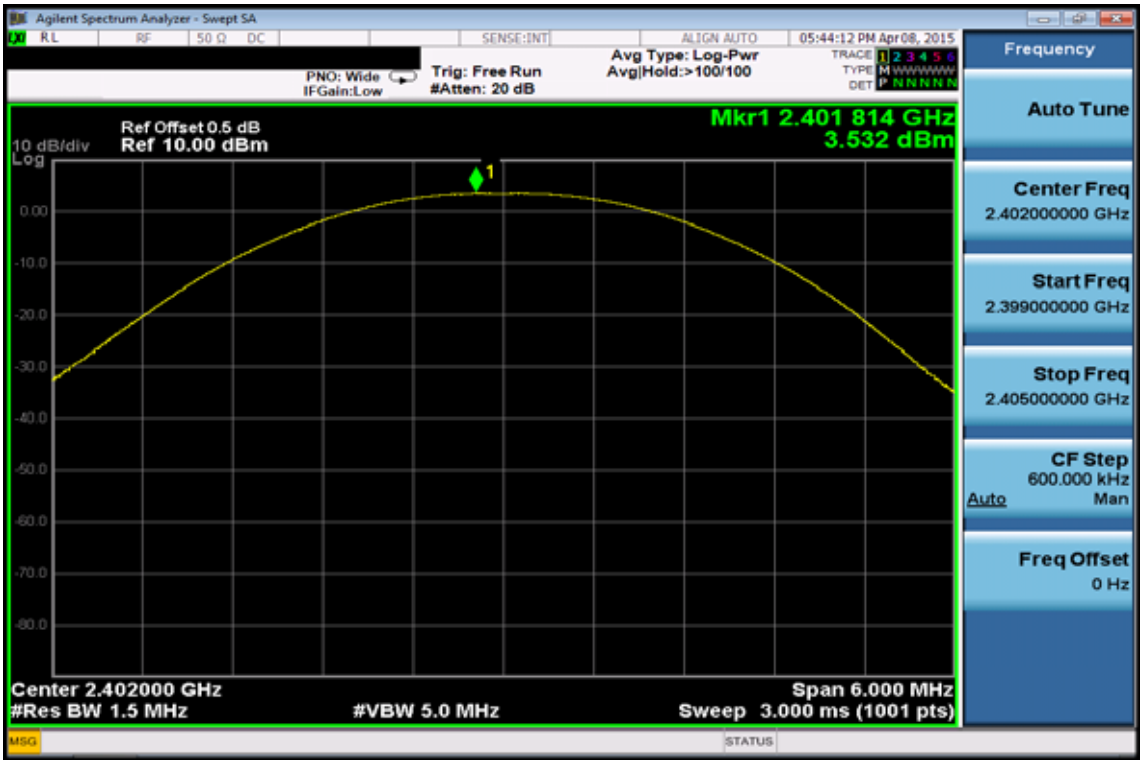
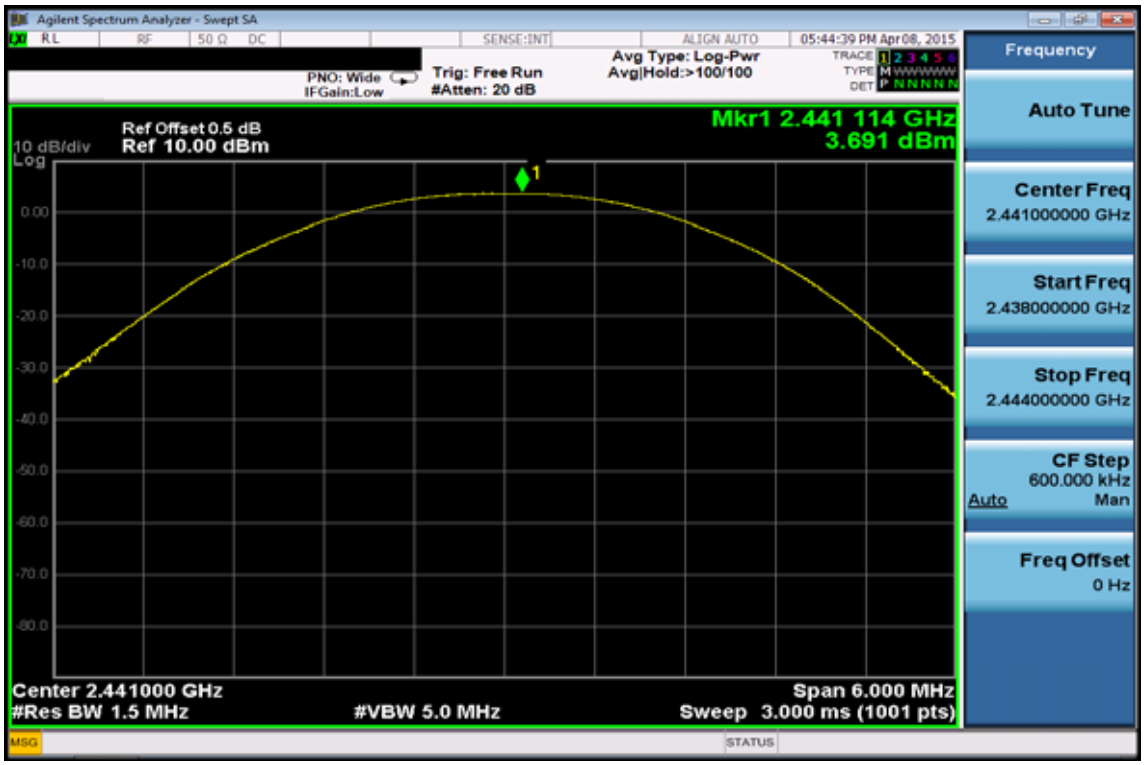
Peak Power Output Data Plot (CH Low) (EDR mode) (π/4DQPSK)



Peak Power Output Data Plot (CH Mid) (EDR mode) (π/4DQPSK)



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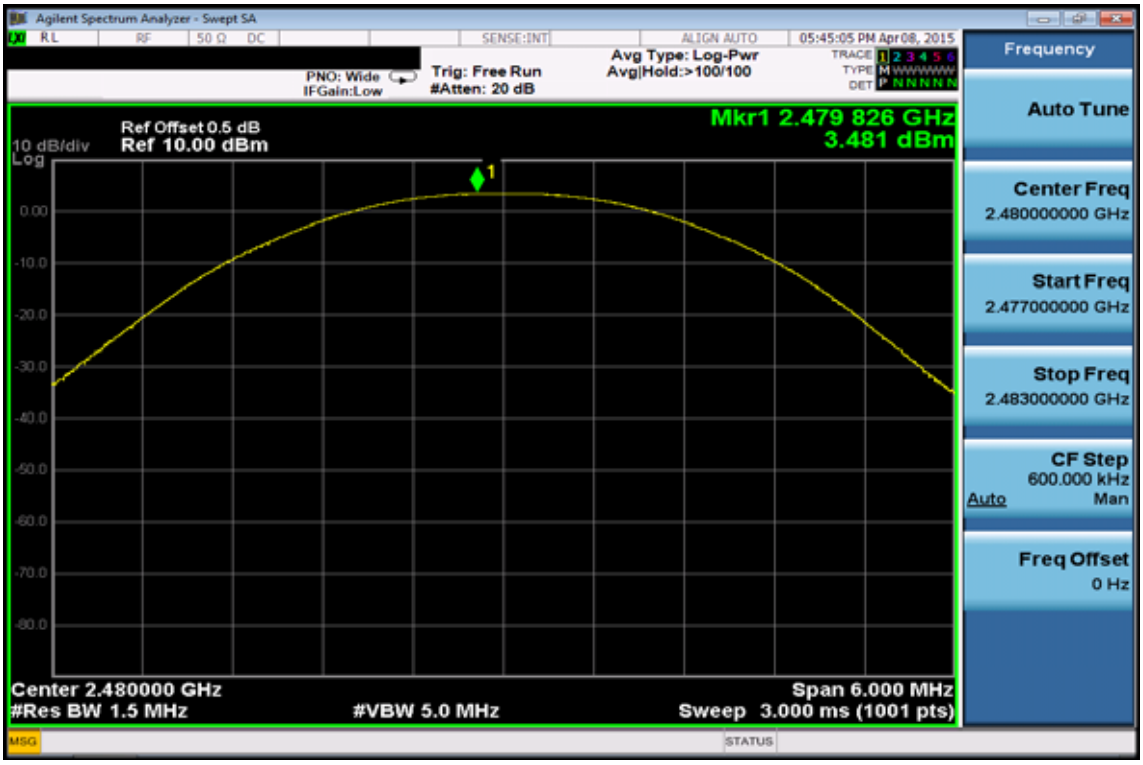
Peak Power Output Data Plot (CH High) (EDR mode) (π/4DQPSK)



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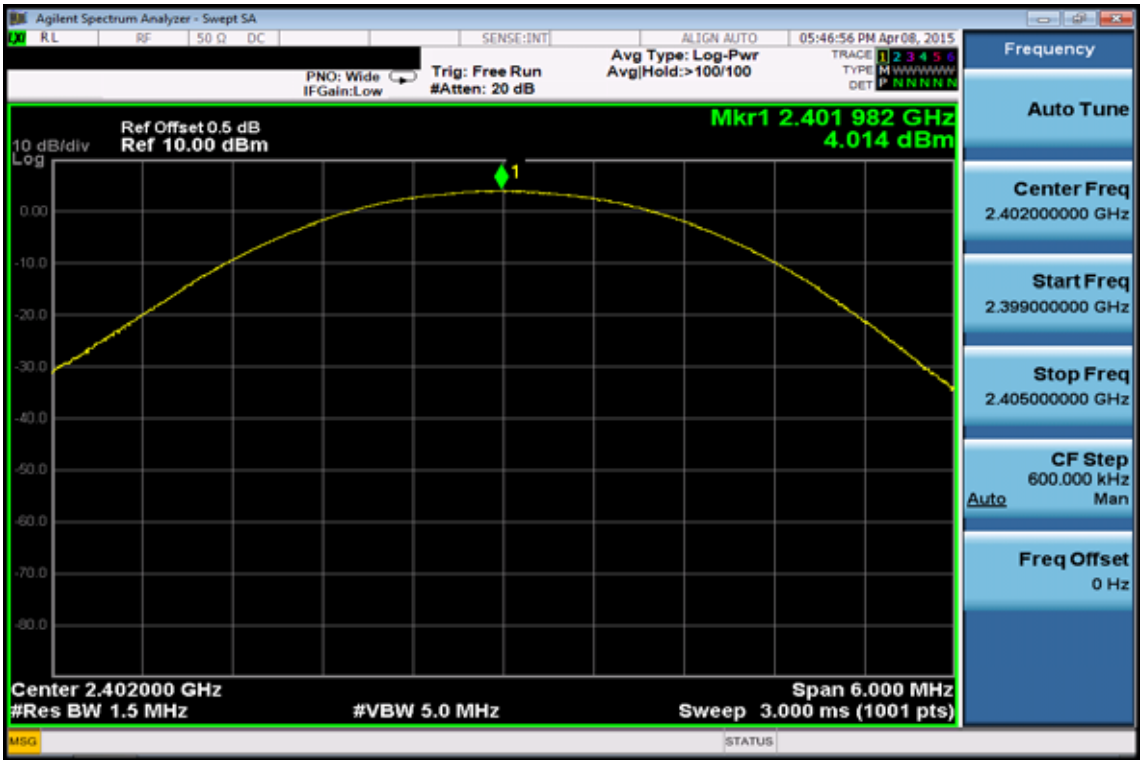
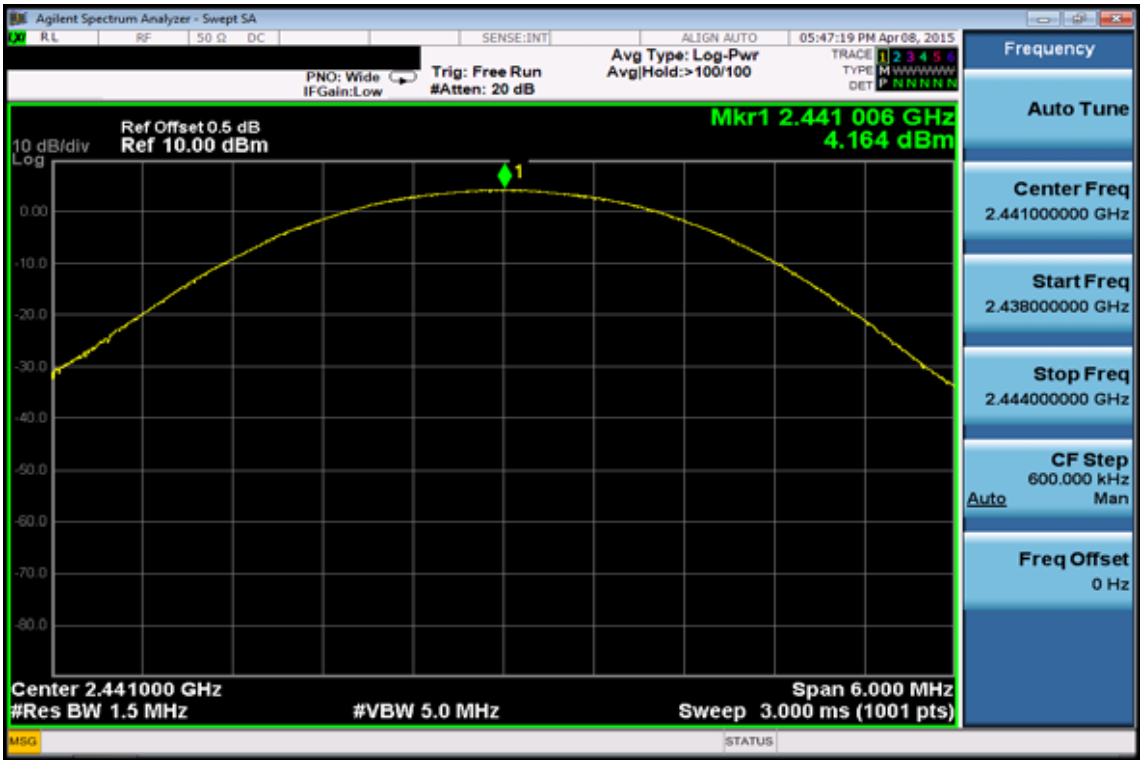
Peak Power Output Data Plot (CH Low) (EDR mode) (8DPSK)



Peak Power Output Data Plot (CH Mid) (EDR mode) (8DPSK)



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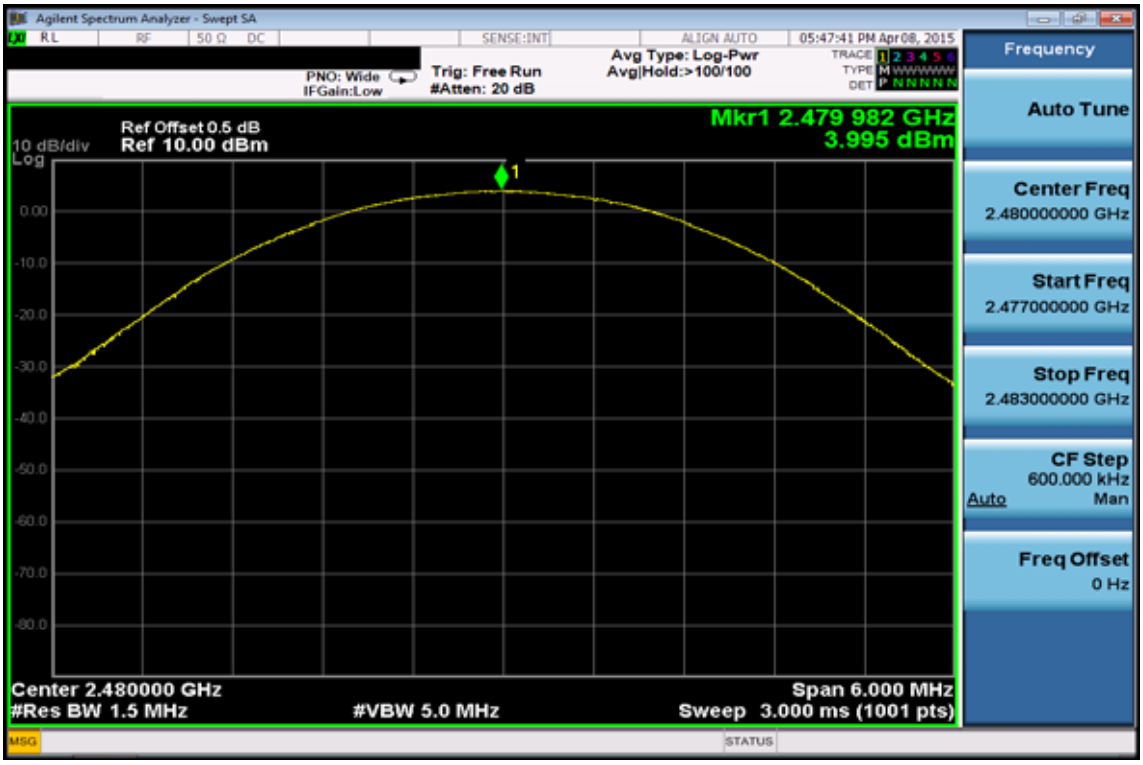
Peak Power Output Data Plot (CH High) (EDR mode) (8DPSK)



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7. BAND EDGES MEASUREMENT

7.1. Standard Applicable:

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

According to RSS-Gen §8.9 and RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 4 and 5 is not required. In addition, radiated emissions which fall in the restricted bands of Table 6 must also comply with the radiated emission limits specified in Tables 4 and 5.

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7.2. Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/26/2014	05/25/2015
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/19/2014	05/18/2015
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	12/22/2014	12/21/2015
Spectrum Analyzer	R&S	FSV-30	101398	10/07/2014	10/06/2015
Loop Antenna	ETS.LINDGREN	6502	00148045	07/03/2014	07/02/2015
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/23/2014	12/22/2015
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2014	05/18/2015
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2014	12/24/2015
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2015	01/01/2016
Pre-Amplifier	Agilent	8449B	3008A00578	01/02/2015	01/01/2016
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/02/2015	01/01/2016
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	01/02/2015	01/01/2016
Attenuator	Mini-Circuit	BW-S10W2+	004	01/02/2015	01/01/2016
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/02/2015	01/01/2016
3m Site NSA	SGS	966 chamber	N/A	07/15/2014	07/14/2015

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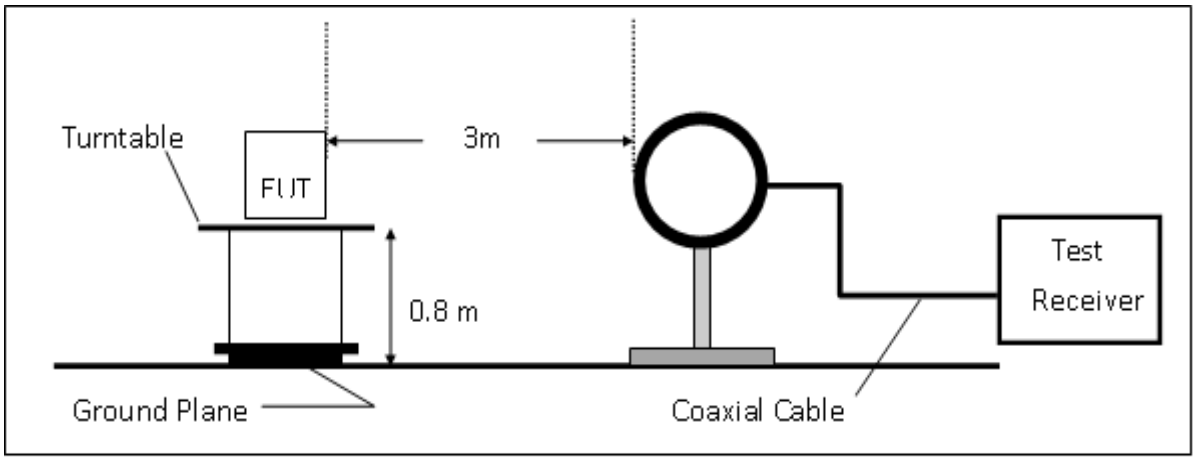
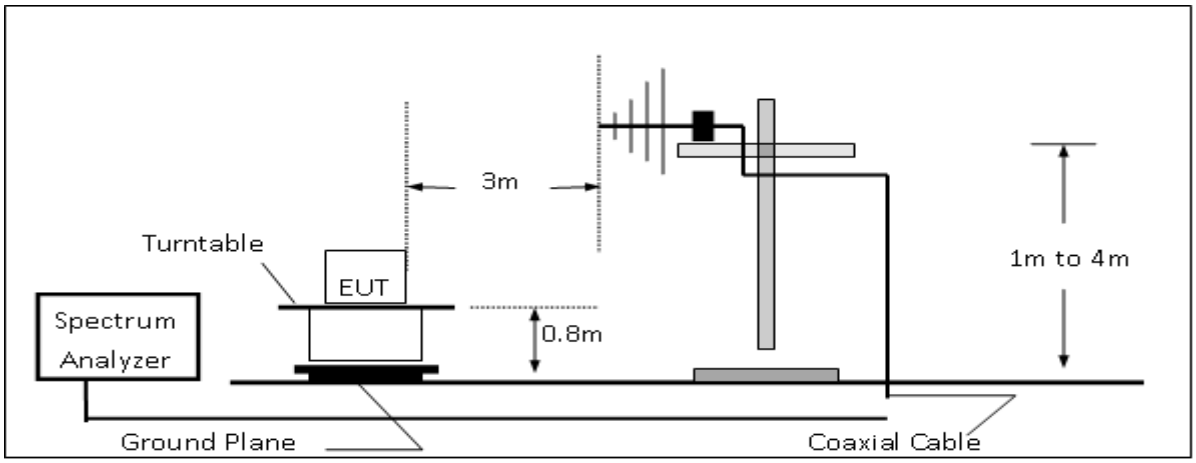
7.3. Test SET-UP:

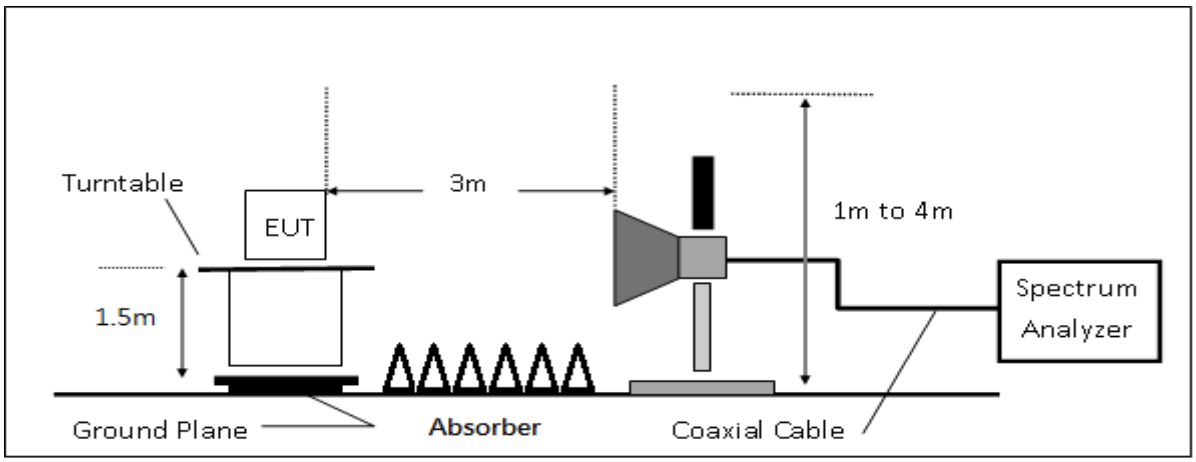
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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7.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all default test channel were completed.

7.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

The limit of the emission level is expressed in dBuV/m, which converts 20*log(uV/m)

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :

"**F**" : denotes Fundamental Frequency. ; "**H**" : denotes Harmonic Frequency.

"**E**" : denotes Band Edge Frequency. ; "**S**" : denotes Spurious Frequency.

7.6. Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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7.6.1 Radiated Emission – Band Edge: (Worst: EDR mode) Hopping mode

Operation Band	:EDR+Hopping	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV / m	dBµV / m	dB
2390.00	E	Average	30.10	5.16	35.26	54.00	-18.74
2390.00	E	Peak	42.28	5.16	47.44	74.00	-26.56

Operation Band	:EDR+Hopping	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV / m	dBµV / m	dB
2390.00	E	Average	30.12	5.16	35.28	54.00	-18.72
2390.00	E	Peak	43.35	5.16	48.51	74.00	-25.49

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Operation Band	:EDR+Hopping	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV / m	Limit @3m dBμV / m	Margin dB
2483.50	E	Average	30.08	6.01	36.09	54.00	-17.91
2483.50	E	Peak	41.08	6.01	47.09	74.00	-26.91

Operation Band	:EDR+Hopping	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.
"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV / m	Limit @3m dBμV / m	Margin dB
2483.50	E	Average	30.04	6.01	36.05	54.00	-17.95
2483.50	E	Peak	43.72	6.01	49.73	74.00	-24.27

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Band Edge: (Worst: EDR mode) Non-Hopping mode

Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV / m	Limit @3m dBµV / m	Margin dB
2390.00	E	Average	30.27	5.16	35.43	54.00	-18.57
2390.00	E	Peak	43.53	5.16	48.69	74.00	-25.31

Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV / m	Limit @3m dBµV / m	Margin dB
2390.00	E	Average	30.37	5.16	35.53	54.00	-18.47
2390.00	E	Peak	44.76	5.16	49.92	74.00	-24.08

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Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV / m	dBµV / m	dB
2483.50	E	Average	30.72	6.01	36.73	54.00	-17.27
2483.50	E	Peak	45.65	6.01	51.66	74.00	-22.34

Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV / m	dBµV / m	dB
2483.50	E	Average	31.28	6.01	37.29	54.00	-16.71
2483.50	E	Peak	47.59	6.01	53.60	74.00	-20.40

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8. SPURIOUS EMISSION TEST

8.1. Standard Applicable:

According to §15.247(d),

Emission at antenna port:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Radiated Spurious Emission

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-Gen §8.9 and RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 4 and 5 is not required. In addition, radiated emissions which fall in the restricted bands of Table 6 must also comply with the radiated emission limits specified in Tables 4 and 5.

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8.2. Measurement Equipment Used:

Refer to section 7.2 for details.

8.3. Test SET-UP:

Refer to section 7.3 for details.

8.4. Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all test default channels were complete.

Auxiliary Procedure (Setting on Spectrum to capture the reading of emission level):

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

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8.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Remark:

1. The limit of the emission level is expressed in dBuV/m, which converts 20*log(uV/m)
2. Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)
3. Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :

"**F**" : denotes Fundamental Frequency. ; "**H**" : denotes Harmonic Frequency.

"**E**" : denotes Band Edge Frequency. ; "**S**" : denotes Spurious Frequency.

8.6. Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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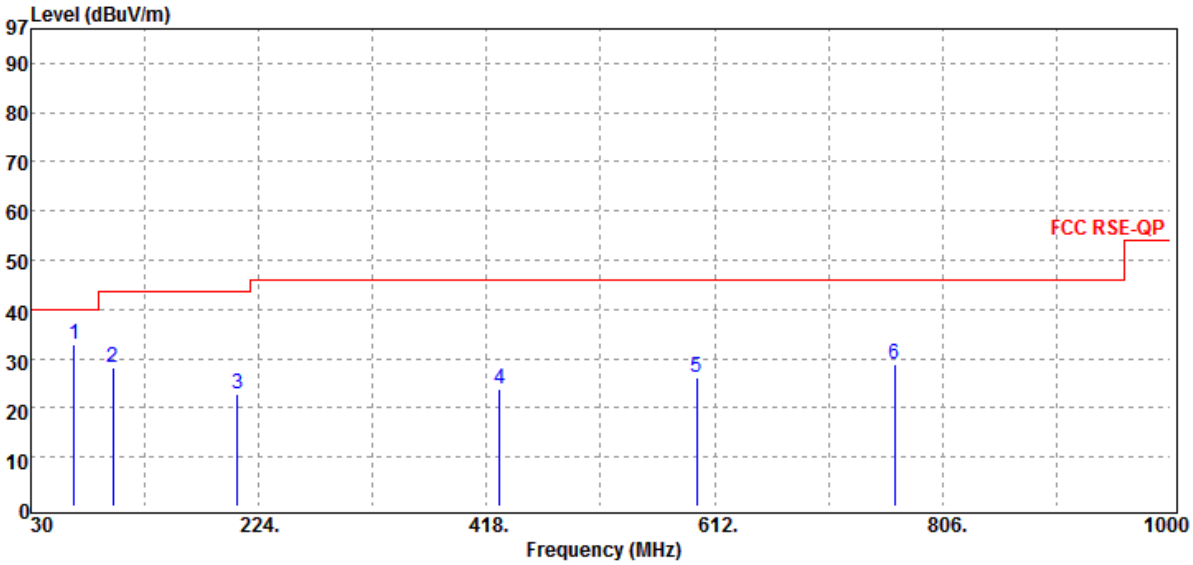
8.6.1 Radiated Spurious Emission Measurement Result: (Worst: EDR mode)

For Frequency form 30MHz to 1000MHz

Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
66.86	S	Peak	44.03	-11.21	32.82	40.00	-7.18
99.84	S	Peak	42.65	-14.32	28.33	43.50	-15.17
205.57	S	Peak	34.19	-11.44	22.75	43.50	-20.75
428.67	S	Peak	29.47	-5.75	23.72	46.00	-22.28
596.48	S	Peak	28.00	-1.73	26.27	46.00	-19.73
765.26	S	Peak	27.73	1.11	28.84	46.00	-17.16

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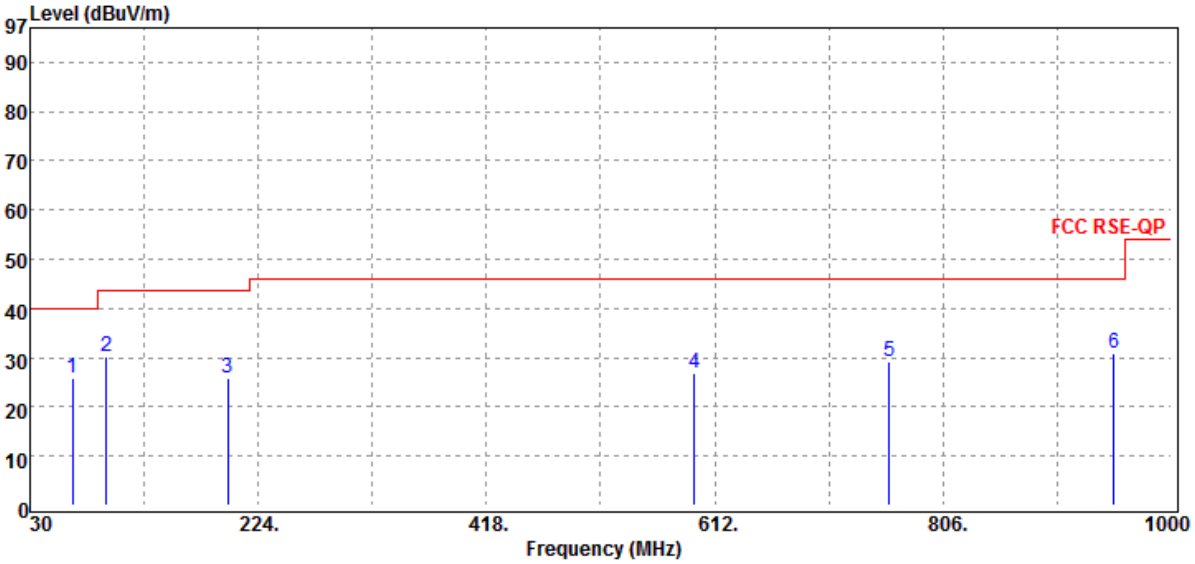
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
65.89	S	Peak	37.00	-11.07	25.93	40.00	-14.07
94.99	S	Peak	45.08	-14.90	30.18	43.50	-13.32
197.81	S	Peak	37.73	-11.77	25.96	43.50	-17.54
594.54	S	Peak	28.42	-1.63	26.79	46.00	-19.21
760.41	S	Peak	28.15	1.11	29.26	46.00	-16.74
951.50	S	Peak	27.45	3.36	30.81	46.00	-15.19

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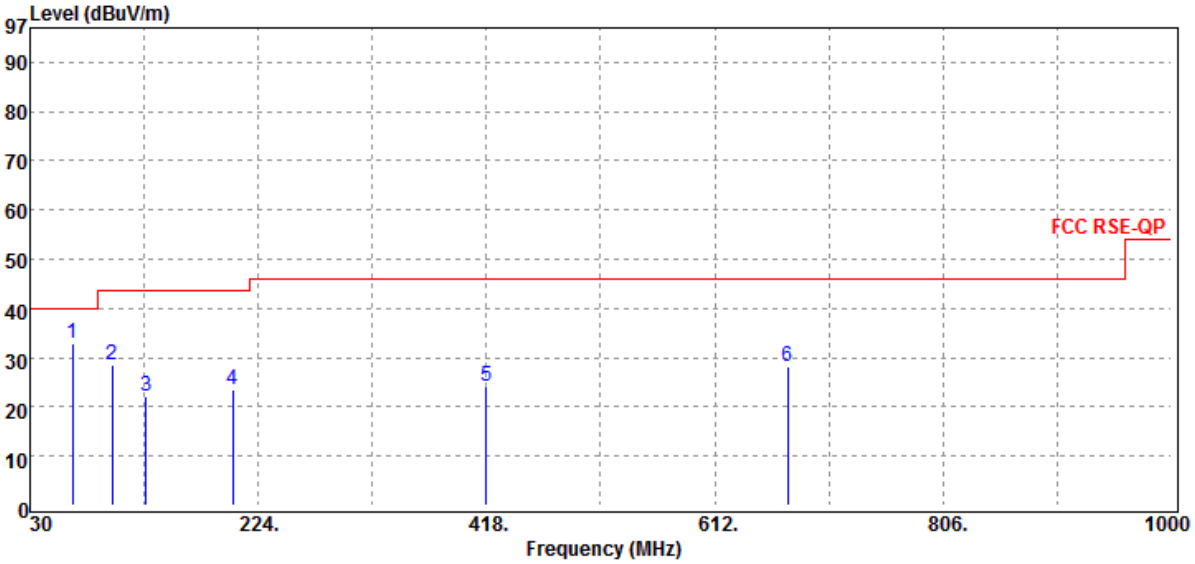
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
65.89	S	Peak	44.12	-11.07	33.05	40.00	-6.95
99.84	S	Peak	42.69	-14.32	28.37	43.50	-15.13
128.94	S	Peak	32.70	-10.59	22.11	43.50	-21.39
202.66	S	Peak	35.14	-11.63	23.51	43.50	-19.99
418.00	S	Peak	29.70	-5.68	24.02	46.00	-21.98
674.08	S	Peak	29.33	-1.12	28.21	46.00	-17.79

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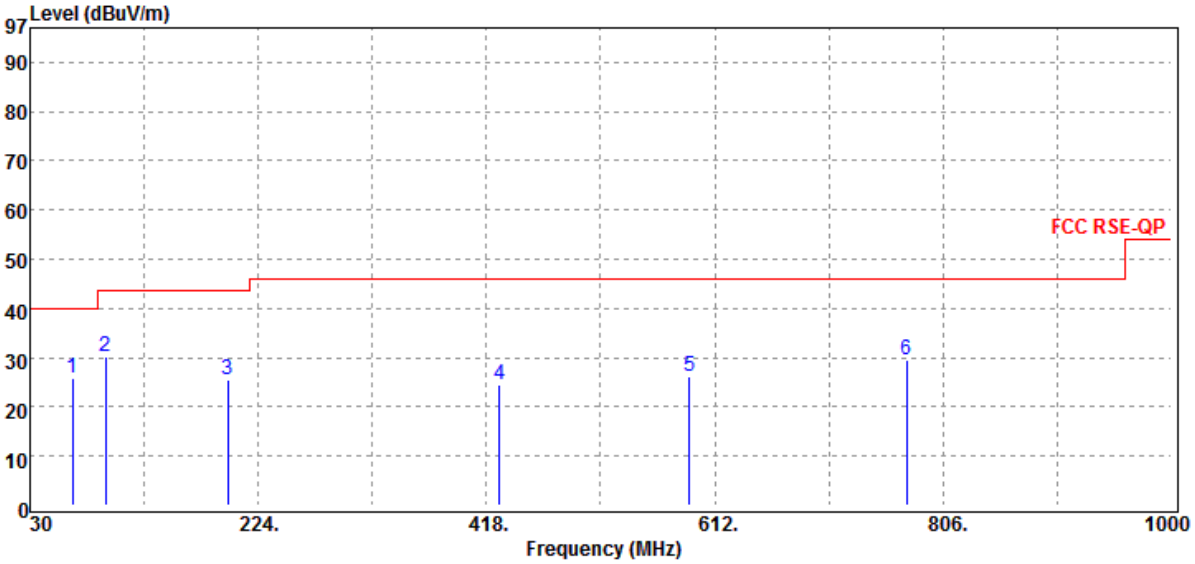
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
65.89	S	Peak	37.05	-11.07	25.98	40.00	-14.02
94.02	S	Peak	45.32	-15.01	30.31	43.50	-13.19
197.81	S	Peak	37.17	-11.77	25.40	43.50	-18.10
428.67	S	Peak	30.23	-5.75	24.48	46.00	-21.52
590.66	S	Peak	27.67	-1.53	26.14	46.00	-19.86
774.96	S	Peak	28.67	0.73	29.40	46.00	-16.60

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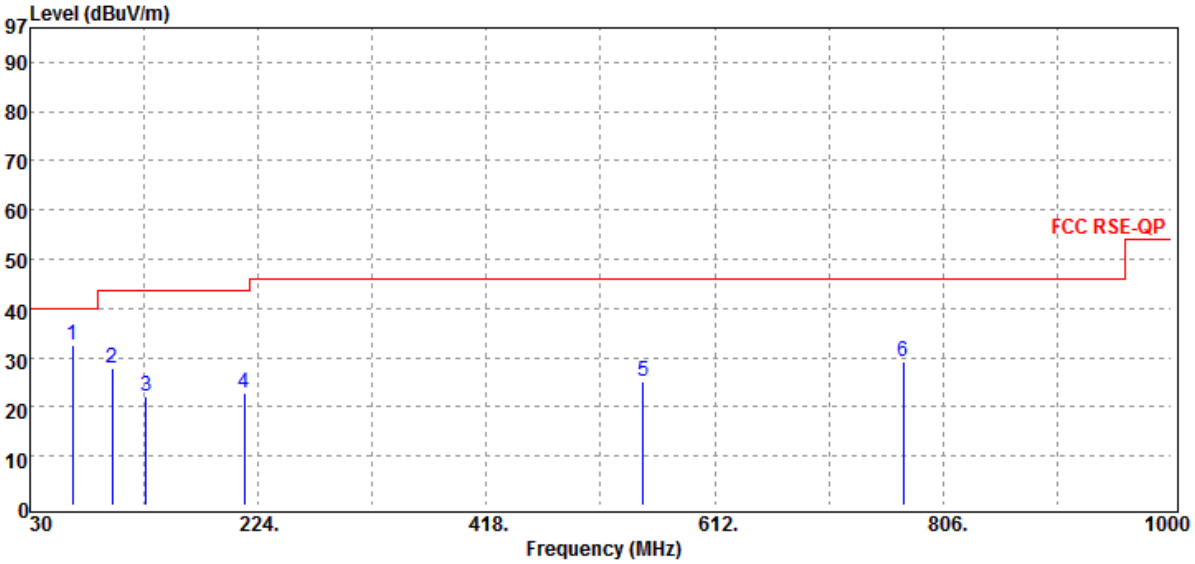
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
65.89	S	Peak	43.73	-11.07	32.66	40.00	-7.34
99.84	S	Peak	42.13	-14.32	27.81	43.50	-15.69
128.94	S	Peak	32.85	-10.59	22.26	43.50	-21.24
212.36	S	Peak	33.99	-11.13	22.86	43.50	-20.64
550.89	S	Peak	29.17	-4.05	25.12	46.00	-20.88
772.05	S	Peak	28.32	0.86	29.18	46.00	-16.82

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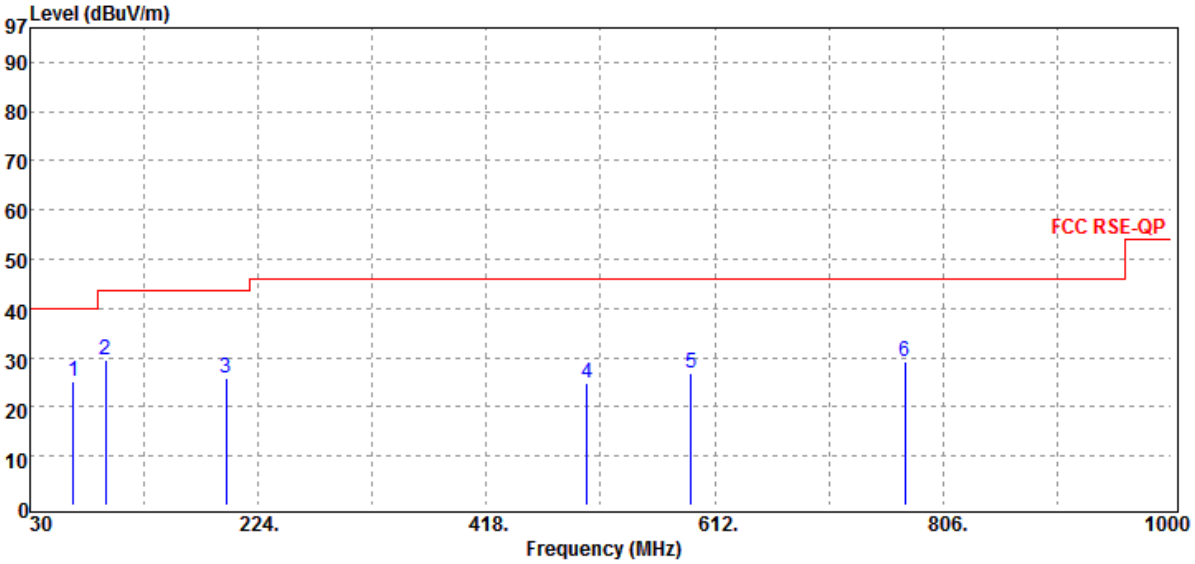
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
66.86	S	Peak	36.43	-11.21	25.22	40.00	-14.78
94.02	S	Peak	44.46	-15.01	29.45	43.50	-14.05
196.84	S	Peak	37.54	-11.75	25.79	43.50	-17.71
503.36	S	Peak	29.13	-4.39	24.74	46.00	-21.26
591.63	S	Peak	28.43	-1.53	26.90	46.00	-19.10
773.99	S	Peak	28.43	0.78	29.21	46.00	-16.79

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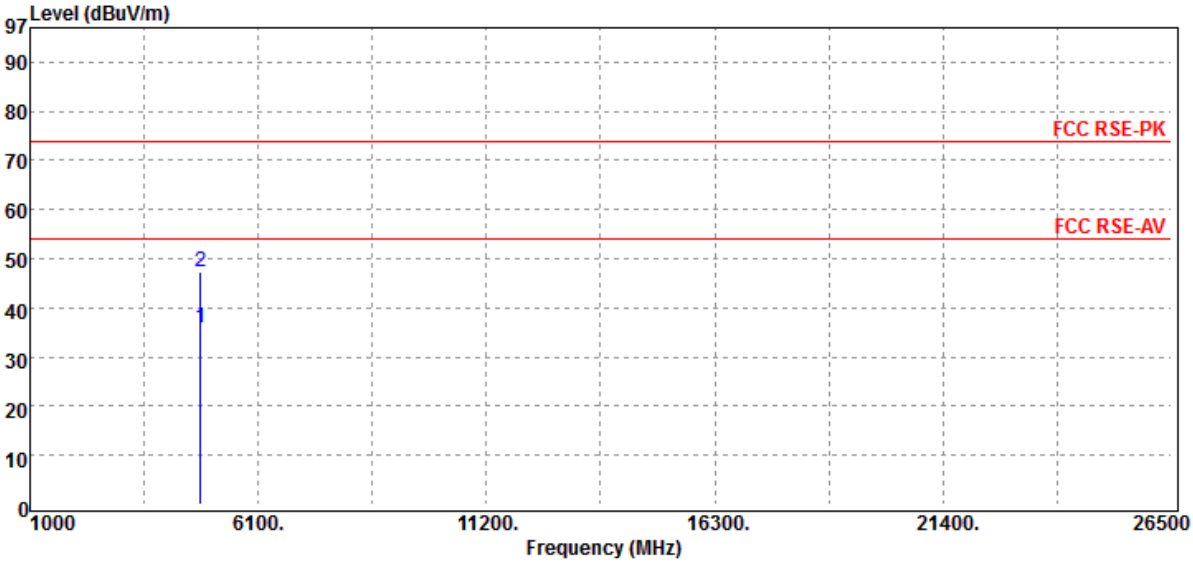
Radiated Spurious Emission Measurement Result: (Worst: EDR mode)

For Frequency over 1GHz

Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4804.00	H	Average	26.46	9.56	36.02	54.00	-17.98
4804.00	H	Peak	37.83	9.56	47.39	74.00	-26.61

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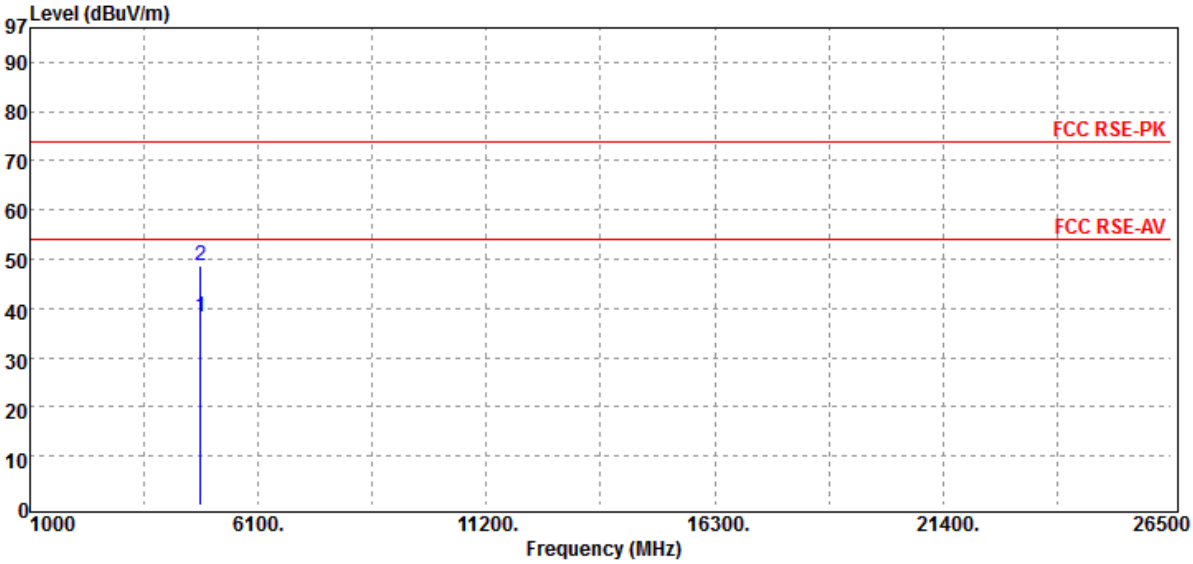
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2402 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4804.00	H	Average	28.81	9.56	38.37	54.00	-15.63
4804.00	H	Peak	38.97	9.56	48.53	74.00	-25.47

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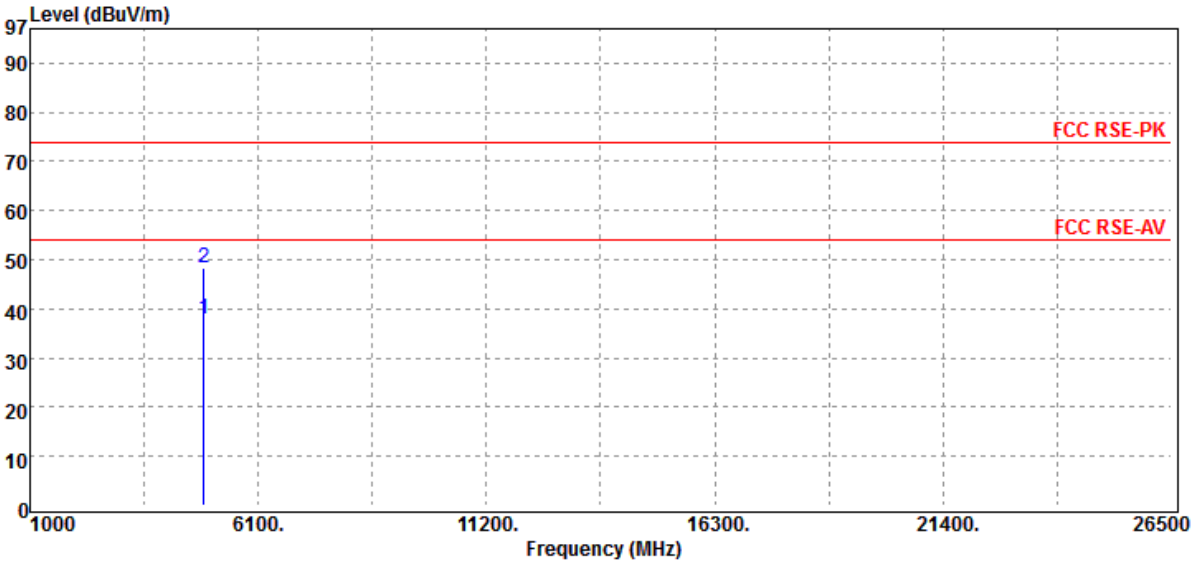
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4882.00	H	Average	28.14	9.85	37.99	54.00	-16.01
4882.00	H	Peak	38.49	9.85	48.34	74.00	-25.66

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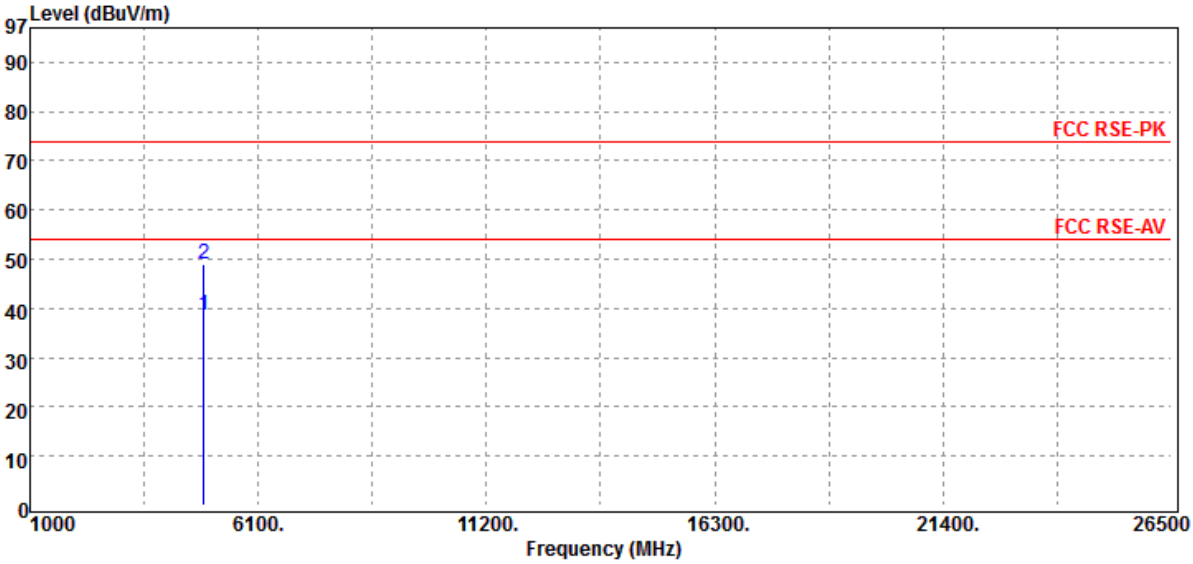
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2441 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX MID	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4882.00	H	Average	28.60	9.85	38.45	54.00	-15.55
4882.00	H	Peak	39.13	9.85	48.98	74.00	-25.02

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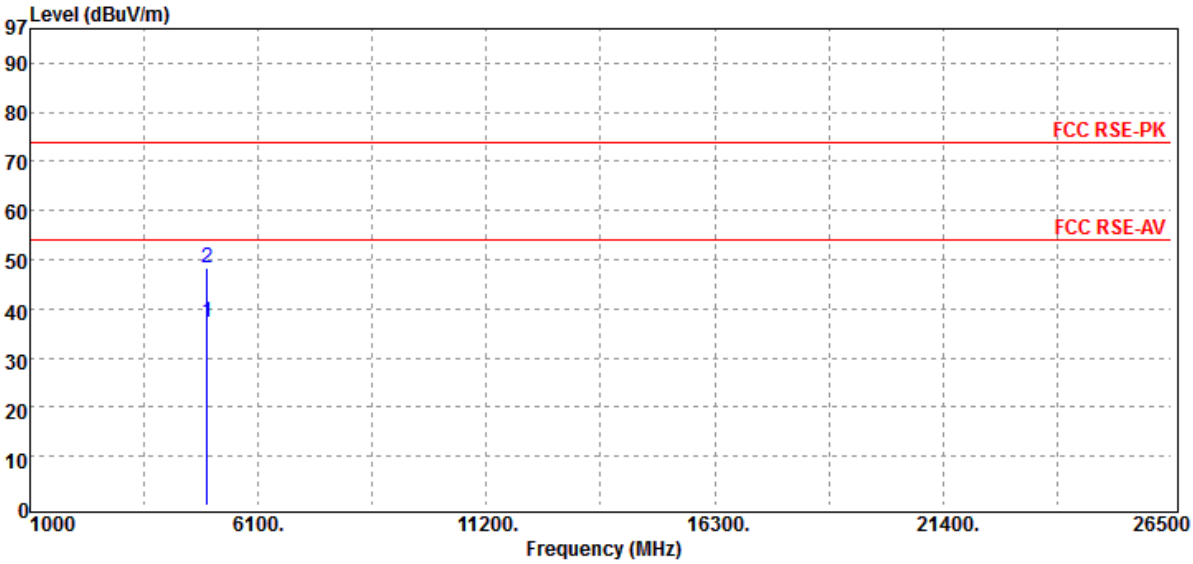
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
4960.00	H	Average	27.40	9.86	37.26	54.00	-16.74
4960.00	H	Peak	38.42	9.86	48.28	74.00	-25.72

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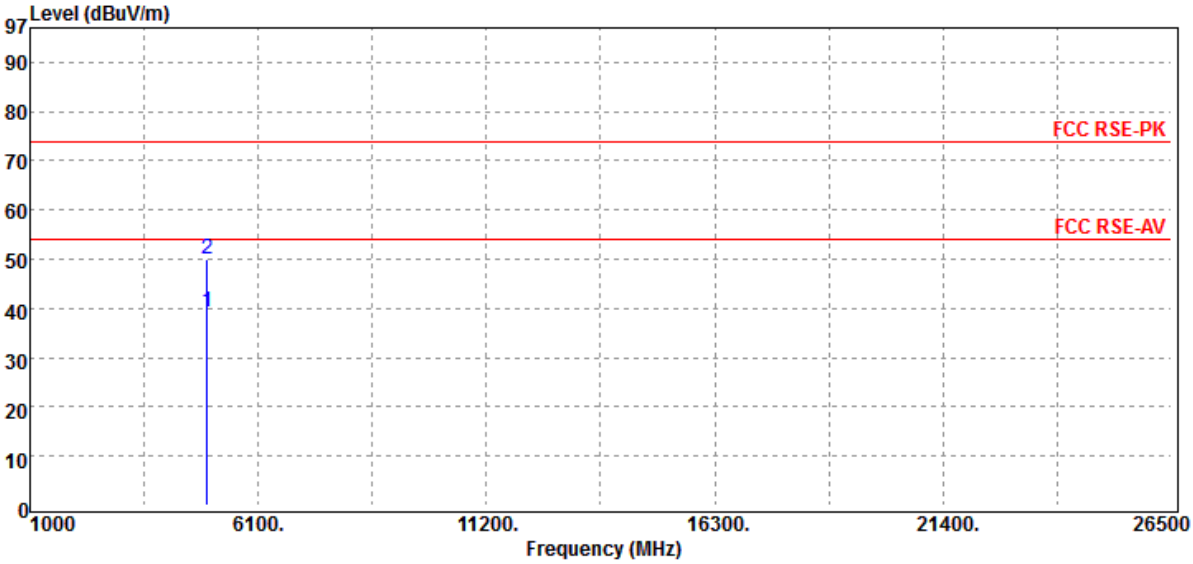
Operation Band	:EDR	Test Date	:2015-04-17
Fundamental Frequency	:2480 MHz	Temp./Humi.	:23 deg_C / 62 RH
Operation Mode	:TX HIGH	Engineer	:Curry
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4960.00	H	Average	29.37	9.86	39.23	54.00	-14.77
4960.00	H	Peak	40.20	9.86	50.06	74.00	-23.94

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9. ANTENNA REQUIREMENT

9.1. Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

According to RSS-GEN 6.7, As per RSP-100, each applicant for equipment certification must provide a list of all antenna types that may be used with the transmitter, indicating the maximum permissible antenna gain (in dBi).

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements, including the antenna type used.

In addition, applicants shall perform RF power and spurious emission measurements with each antenna type supplied or specified by the manufacturer for use with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

9.2. Antenna Connected Construction:

The directional gains of antenna used for transmitting is 0.73dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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